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CONSTRUCTION AND FABRICATION

PIPING

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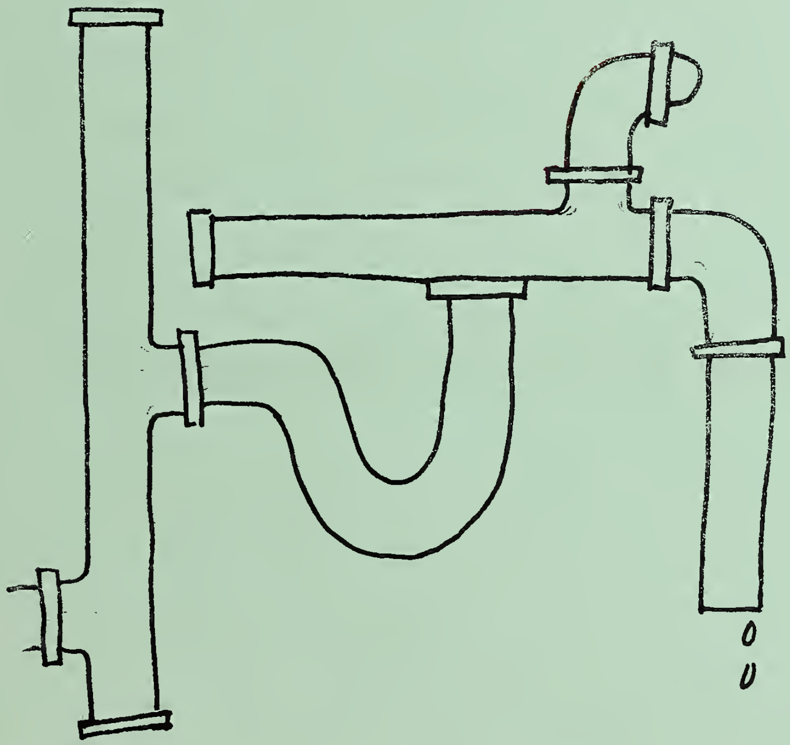

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NOTE: This Curriculum Guide is a service publication only. The Senior High School Program of Studies contains the official statement concerning Senior High School Drafting. The information contained in the Guide is prescriptive insofar as it duplicates that contained in the Program of Studies. There are in the Guide, however, as well as content, methods of developing the concepts, suggestions for the use of teaching aids and lists of additional reference books.

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I. INDUSTRIAL EDUCATION

Industrial Education is a program consisting of courses which provide a continuum of experiences, starting with exploratory activities in the junior high school and expanding in the high school to the development of skills related to career fields. This development of the student's skills is planned for through courses in Industrial Arts and Vocational Education culminating in on-the-job work experience, or entry into a job or post-high school institution for further education.

The program consists of courses ranging from those designed for an exploration of the technologies and trade areas to units of practical preparation for a career. In the process the courses develop the student's knowledge of himself, his talents and his skills.

The Industrial Education course "guides" provide the teacher with an outline of the topics, generalizations and concepts selected as most relevant for the physical and mental development of the students and the logical development of the subject area in accordance with the resources of the school in both teaching personnel and facilities.

The Guide leaves much scope for the teacher to develop content related to the topics, especially in writing behavioural objectives describing specific changes in student behaviour anticipated from the learning tasks.

It is expected that each school district will develop a program of Industrial Education appropriate to the fulfilment of the needs of its student clientele.

II. OBJECTIVES

A. Industrial Education Objectives

The general objectives of Industrial Education complement the aims and objectives of the secondary school. The objectives of Industrial Education are:

1. To provide students with the curriculum content designed to develop fundamental tool and procedural skills which help prepare them to enter a family of occupations.
2. To provide students with courses that serve as vehicles which help them relate their academic knowledge to vocational competencies.

3. To provide students the opportunity to develop basic competencies, both academically and in work skills to enter either a job or a post-high school institution for further education.

4. To provide students with the environment whereby they may develop sound attitudes, acceptable work habits, and achieve a feeling of accomplishment.

B. Construction and Fabrication Career Field Objectives

The Construction and Fabrication career field should provide a student an opportunity to:

1. Gain an understanding of the career field.

2. Develop skills and knowledge necessary for job entry and/or articulation with post-secondary educational institutions.

3. Develop a standard of performance acceptable to craftsmen in the trade, government and industry.

4. Study labor organization and legislation regulating working conditions.

C. Major Area of Study Objectives

The specific objectives of the piping program are in harmony with the purposes of the Industrial Education Program and are as follows:

The piping courses shall provide students the opportunity to:

1. Learn and work in an environment that enables them to make a realistic assessment of themselves, their interests and aptitudes as they relate to piping.

2. Develop habits and attitudes acceptable to the trade concerning safety, working relationships, and efficient use of time and material.

3. Develop basic competencies in the use of tools, materials and processes that may be used to gain advanced placement in apprenticeship, technical institute programs or on the job.

III. EVALUATION

Evaluation of student growth should be based on stated behavioural changes and specific criteria understood by the students. Allowance should be made for both self and teacher evaluation and in some cases peer evaluation. Evaluation should further be based on the three domains of learning as defined by an Alberta committee of Industrial Education teachers. Their categories are as follows:

a. Verbal and Written Communication
b. Personal Growth
c. Manipulative Skills

The weighting given each of the three measures will depend on the nature of the behaviour being evaluated. For a more detailed treatment of evaluation see the Industrial Education Handbook.

IV. ORGANIZATION

A. Guide Organization

The course guides are developed on the following pattern:

1. Topic: Each course is subdivided into a number of topics.

2. Generalization: The main generalization or "big" idea that students should learn learn follows each topic.

3. Concepts: The concepts divide the topic into the teaching components. They give more direction on specific areas that should be studied.

4. Behavioural Objectives: These describe specific changes in student behaviour which result from the learning tasks he performs.

   The Guide gives only a few sample behavioural objectives. It is the responsibility of the teacher to develop as many behavioural objectives as he can teach in the time available.

Facts are taken to be items of specific information, concepts are categories of information and generalizations express the relationship between concepts.

In planning a lesson, the teacher moves down this hierarchy whereas in learning, the student begins with facts and moves upward.

Generalizations

Teacher Concepts Concepts Student

Facts Facts

5. Suggested Activities: A few suggestions are made as to the types of activities that could be used to achieve the behavioural objectives.

6. Resource Materials: This column suggests where materials may be obtained.

B. Program Organization

1. Program Description

The Piping section of the Construction and Fabrication field of study is an area concerning the trades using piping, such as plumbing, gasfitting, hot water and steamfitting and general pipefitting.

Students have the opportunity to learn the theory and skills necessary in the piping trades. Further, they will learn about the trade organization, job opportunities, business practices and enough skills to get a job, go into apprenticeship or enhance their avocational interests.

2. Program Major Organization

The major is divided into six five-credit modules and one module of 5-10 credits. Entry into the major is through Materials 10, General Technology 10 or Piping 12. The second and third level modules ("22" and "32") are non-sequential and can be taken in any order with the exception of Piping 32C.

32C is the last course in the 35-credit sequence and can be used to:

a. provide greater depth to a module taken previously.

b. take work in actual construction under a work experience plan whereby the Piping teacher supervises the student on the job. The student must be under the supervision of a journeyman while on the job.

In addition to the modules set out in the major for Piping a student may select modules designated as minors. These are normally the first level or introductory course to the area, e.g. Building Construction would be Introduction to Carpentry.

A student wishing to meet the requirements of the Apprenticeship Branch must complete all seven modules in the major area.

Some students, however, may take only a few modules in a major area as a supplement to their academic program or they may broaden their selection to other career fields. The scope of the Industrial Education Program allows the flexibility necessary for the program to be tailored to meet the interests and needs of the individual class or student.

The chart on Page 6 gives a graphic description of the Piping program. Each module is identified and the sequences are indicated by lines, e.g. After a student has completed one of Piping 12 or Materials 12 (10 for 1973-74) or General Technology 10 he/she may advance to any module to which the solid line leads. In this case any of 22A, 22B, 22C 32A or 32B. Only 32C requires that all modules above it be completed.

Once a student has enrolled in a "22" or second level course he may also select modules from the minor fields.

Students may find some of the courses in the listed related fields are beneficial to their career program development. They are encouraged to take some of these to complement their program.

3. Facility Organization

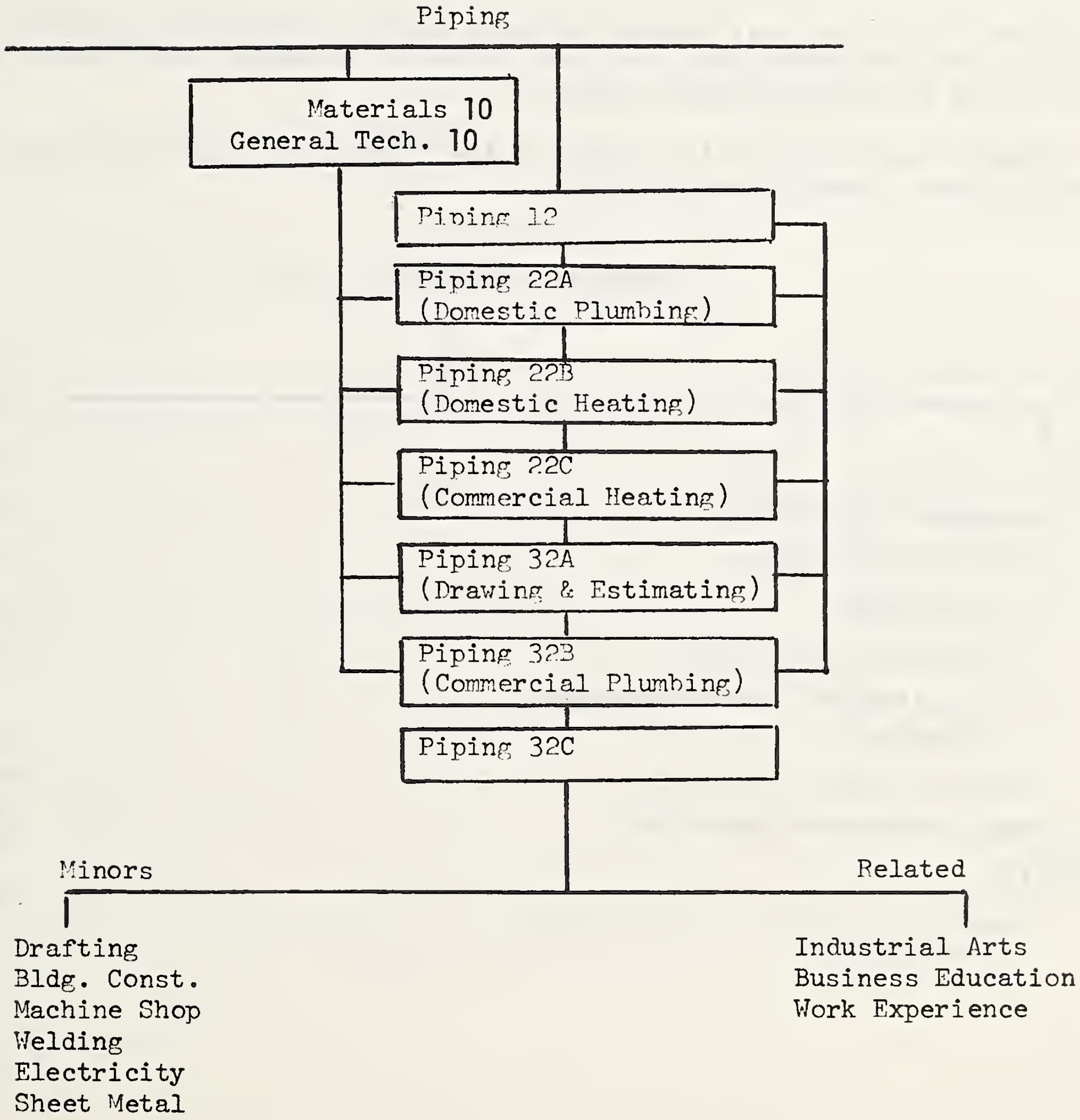
The organization of the physical facilities is in part determined by the original plan. There are however adjustments that can be made in the layout by the teacher to accommodate his/her style of teaching. The number of students in a class affects the way the lab or shop is organized. While most of the shops in Alberta are designed for 16 to 20 students a number of factors must be considered in the final assignment of class load. These factors include:

1. physical size of the shop or laboratory
2. type of student
3. amount of equipment
4. type of programming
5. type of course
6. training and experience of the teacher.

Safety of the students and their opportunity to obtain teacher contact are important considerations when class loads are determined.

CAREER FIELD

CONSTRUCTION AND FABRICATION



V. CAREER OPPORTUNITIES

Piping is a vocational program designed to give students at least first year proficiency in pipe trades and thereby one less year to serve in apprenticeship upon successful completion of the course and apprenticeship exams.

Students having taken all or most of the modules in the major sequence may look forward to the following career opportunities.

Piping 12-22-32 (35 credits)

Post High School Studies

N. A. I. T. or S. A. I. T.
- Petroleum Technology
- Engineering Graphics
- Gas Technology
- Environmental Technology
- Air Conditioning and Refrigeration Technology
- Instrumentation Technology
- Power Engineering Technology

UNIVERSITY
- Teaching at N.A.I.T., S.A.I.T. or High School

Career

Apprenticeship as:
- Plumber
- Gasfitter
- Steamfitter
- Foreman

Inspector of
- -plumbing
- -gas fitting
- -apprentices

Salesman

VI. PIPING

1. Piping 12

   Introductory Course

INTRODUCTION

Piping 12 is the introductory course to the Piping modules. It provides the students with the many experiences found in the career field to help him make an informed decision about future studies.

I. OBJECTIVES

The purpose of this course is:

1. to provide an opportunity for students to learn about the career field of piping

2. to provide the students an opportunity to learn and practice correct and safe procedures in the use of piping materials and tools.

II. CONTENT SUMMARY

1. Career field study
   - -occupations
   - -employment opportunities

2. Trade study
   - -certification
   - -structure of the piping industry
   - -union organization

3. Safety

4. Measurement
   - -systems; English, metric
   - -instrument used
   - -layout

5. Piping tools and methods of joining pipe
   - -threading
   - -soldering
   - -caulking
   - -mechanical joints
   - -cementing

6. Adapting pipes and fittings
   - -steel to copper
   - -metal to plastic
   - -substituions

7. Identifying, selecting and ordering materials
   - -reading fittings
   - -identifying and selecting materials
   - -valve functions

III. REFERENCES

Prime References -

1. *Plumbing Information Sheets*
2. *Steamfitting and Hot Water Heating Information Sheets*

The above are printed by the Canadian Plumbing and Heating Contractors, Ottawa, Ontario

3. *Alberta Provincial Plumbing Code*
4. *C.S.A. Gas Code*
5. *Pipefitters Handbook by Frankland*
6. *Trane Company Publication in Two Volumes on Steam and Hot Water Heating*
7. *National Building Code of Canada - Plumbing section*
8. *Trade Literature.*

IV. CONTENT

Generalizations, concepts and behavioural objectives are outlined on the following pages. Teachers are expected to develop additional behavioural objectives and activities to supplement the identified content and maintain relevancy.

Career Field: Construction and Fabrication

Topic I: CAREER FIELD STUDY

Major: Piping

Generalization A. There are many occupations within and related to the career field of construction and fabrication.

Course: Piping 12 (Introductory Course)

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
1. Career field occupations		The student will:		
(i.) Building Construction (ii.) Piping (iii.) Sheet Metal (iv.) Welding (v.) Machine Shop	6 - 8 hrs.	a. describe the various occupations available in the career field and the requirements for entry into specific occupations.	Lectures by instructor or visiting lecturers, class discussions, field trips, video tapes, etc.	
2. Related Occupations		a. list the courses offered in the school, system or area in this career field.		
3. Employment Opportunities A. Local B. Regional C. Federal		a. assess the employment opportunities in the trade at various locals.	Newspapers and government reports will help here.	

Notes:

Topic II: TRADE STUDY OF PIPING

Generalization B: Piping tradesmen perform an important and rewarding function in modern industrial society.

oncept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
. Pipe tradesmen must be properly certified in order to work at the trade	6 - 10 hrs.	a. record the requirements in apprenticeship, time, education and examination in order to become certified and qualified in piping.	Lectures by the instructor or apprenticeship people. Pamphlets on the subject, etc.	
2. The major branches of the Piping Trades		a. identify the three major branches of piping - (i.) plumbing (ii.) steamfitting (iii.) gasfitting.	Consult government and other printings on careers in piping.	
3. Other opportunities in the piping industry and allied fields		a. identify other areas where their knowledge of piping may be used, such as: (i.) service work (ii.) instrumentation (iii.) oil field work (iv.) piping wholesale work, etc.	Consult the Canada Edition of Occupational Titles and Descriptions.	
4. Structure of the Piping Industry (i.) Government Regulations		a. describe the organizations such as unions and masters association which attempt to improve the conditions of work and regulate trade standards. Discuss:	Guest lecturers from the trade representatives and Department of Labour officials will help illustrate this concept.	

otes:

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
(ii.) Union Organization		(i.) collective bargaining (ii.) labour acts (iii.) apprenticeship training, exams, and contests.		

Notes:

Topic III: SAFETY AWARENESS

Generalization C: A knowledge and practice of safety is essential in all shop activities.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Unsafe Act	5 - 10 hrs.	a. describe the consequences of unsafe acts on construction, in particular the proper methods for: (i.) lifting (ii.) climbing and descending ladders (iii.) tying proper knots in ropes (iv.) use of pulleys (v.) trenching (vi.) handling of natural gas and other gases (vii.) use of protective clothing.	Emphasize safety in all shop and site activities. The compensation inspectors can be used as lecturers here. Also use pertinent films, posters, etc.	
2. Unsafe Condition		a. discuss how to identify conditions which might lead to injuries on the job.		
		b. list benefits under the Workmen's Compensation Act.	Have copies of the Prov. Comp. Act or guest lecturers.	

Notes:

Topic IV: MEASUREMENT IN PIPING

Generalization D: Measurement and layout are essential in the construction and fabrication of materials.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Measurement Systems				
(i.) English		a. state the base of our number system - 10 - and the two measuring systems with emphasis on the English.	Lectures, demonstrations, using both systems of measuring.	
(ii.) Metric		b. Use the new number systems to better understand the common system of base ten.		
(iii.) Systems, (such as the binary) used in programming				
2. Measuring Instruments		a. use the common measuring instruments such as the 10' x 3/4" pocket tape, 50' tape, thermometers, levels for grade per foot, and plumb bobs.	Demonstrate and have students use these instruments in a class project.	
3. Laying out pipes and fittings		a. cut and join various piping materials and fittings using fitting allowances. Terms such as: (i.) end to centre, (ii.) end to face, etc. will be known also.	Have students cut and assemble pipes and fittings using the proper allowances to prevent "cut and try" wasting of material.	

Notes:

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
4. Measuring Piping Offsets	20-30 hrs.	a. given the formula required, measure, lay out and assemble an offset in piping using: (i.) 45° constant (ii.) 60° constant (iii.) 30° constant (iv.) rolling offsets.	Students can make an offset project in any piping the instructor has available.	

Notes:

Generalization E: A knowledge of the purpose and the use of piping tools, joints, and materials is basic to the piping of a building or plant.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Joining Pipe				
(i.) Threading		a. given the tools and materials required, thread pipes of various sizes according to trade practices. This will include the: (i.) hand operated dies (ii.) power operated dies.	Identify, choose, and use threading tools and materials in a small pipe assembly, involving such materials as steel, cast-iron fittings, malleable, etc. Accuracy of measurements and testing for joint tightness will follow completion of these projects.	
(ii.) Soldering		b. given the tools and materials necessary, solder copper pipe and fittings, emphasizing - (i.) cleaning (ii.) fluxing (iii.) heat application (iv.) capillarity.	Do a project similar to the above, using copper pipe and fittings.	
(iii.) Caulking		c. given the proper tools, equipment and materials, caulk a bell and spigot, - cast iron pipe joint using:	Do a project similar to above using cast iron bell and spigot fittings and pipe.	

Notes:

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		(i.) the vertical method, and (ii.) the horizontal method using the running rope. Note - Lead and oakum and P.C.4 joints will be done here.		
(iv.) Mechanical Joints		d. given the proper material and tools, make a mechanical joint in cast iron pipe and fittings.	Repeat the cast iron project above but now using M.J. pipe and fittings.	
(v.) Cementing or Gluing Plastic pipe and Fittings		e. select and use the tools and materials necessary for a a) P.V.C. or b) A.B.S. plastic pipe joint.	Do a project which will illustrate the use of plastic in a similar way such as threading, caulking, etc.	
	30-40 hrs.			

Notes: Rice Engineering Ltd. of Edmonton makes a plastic "O" ring adaptor for joining plastic pipe (P.V.C.) temporarily but securely-saving material costs.

Topic VI: ADAPTING VARIOUS PIPES AND FITTINGS TO EACH OTHER

Generalization F: The ability to adapt, substitute and convert one pipe or fitting to another type is essential knowledge in piping.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Adapting Pipe and/or Fittings		a. given various pipes and fittings, convert from one to another in the manner of the following: (i.) steel to copper (ii.) cast iron to plastic (iii.) use of adaptors, ferrules, etc.	Convert from one material or fitting to another in a composite pipe assembly of various materials such as: steel pipe to copper pipe, or using a plug instead of a cap, etc.	
2. Substituting Pipe and/or Fittings		a. given a variety of pipes and fittings, substitute one for another as is common trade practice. Example: Replacing a cap with a coupling and plug if the former is not available.		
	10-12 hrs.			

Notes:

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		(i.) the vertical method, and (ii.) the horizontal method using the running rope. Note - Lead and oakum and P.C.4 joints will be done here.		
(iv.) Mechanical Joints		d. given the proper material and tools, make a mechanical joint in cast iron pipe and fittings.	Repeat the cast iron project above but now using M.J. pipe and fittings.	
(v.) Cementing or Gluing Plastic pipe and Fittings		e. select and use the tools and materials necessary for a a) P.V.C. or b) A.B.S. plastic pipe joint.	Do a project which will illustrate the use of plastic in a similar way such as threading, caulking, etc.	
	30-40 hrs.			

Notes: Rice Engineering Ltd. of Edmonton makes a plastic "O" ring adaptor for joining plastic pipe (P.V.C.) temporarily but securely-saving material costs.

Topic VI: ADAPTING VARIOUS PIPES AND FITTINGS TO EACH OTHER

Generalization F: The ability to adapt, substitute and convert one pipe or fitting to another type is essential knowledge in piping.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Adapting Pipe and/or Fittings		a. given various pipes and fittings, convert from one to another in the manner of the following: (i.) steel to copper (ii.) cast iron to plastic (iii.) use of adaptors, ferrules, etc.	Convert from one material or fitting to another in a composite pipe assembly of various materials such as: steel pipe to copper pipe, or using a plug instead of a cap, etc.	
2. Substituting Pipe and/or Fittings		a. given a variety of pipes and fittings, substitute one for another as is common trade practice. Example: Replacing a cap with a coupling and plug if the former is not available.		
	10-12 hrs.			

Notes:

Topic VII: IDENTIFYING, SELECTING, ORDERING MATERIAL AND READING FITTINGS

Generalization G: A knowledge of the materials and fittings used in piping is essential to skill performance.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Reading Fittings		a. read fittings to order or pick them out of stock.	Lay fittings on the shop floor with identifying numbers alongside of them - then have students read and type them.	
2. Identifying and Selecting Materials		a. identify the types of materials and fittings as well as know their advantages and disadvantages. (i.) weights of pipe (ii.) types of pipe (iii.) standard lengths (iv.) sizes (N.P.S.). The above are examples of the items to be known in order that they may be delivered to a job site from wholesale houses or stock.	The language of the trade is important, and it should be used at all times in order that students can converse in trade terms.	

otes:

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
3. Functioning of valves	25-30 hrs.	a. choose valves by their size, type, and function, as follows: (i.) stop and start flow-gate (ii.) throttling - globe (iii.) preventing back blow - check (iv.) preventing high pressures or temperatures - temp. and press. relief valves (v.) regulating pressure - press. regulating valves.		

Notes:

VI. PIPING

2. Piping 22A

Domestic Plumbing

INTRODUCTION

Students may advance to Piping 22A from any one of the following introductory courses: Materials 10, General Technology 10 or Piping 12.

I. OBJECTIVES

The objectives of Piping 22A are:

1. to provide students with experience in following plumbing regulations

2. to provide students with the theory and experience necessary to "rough in" and finish domestic plumbing.

II. CONTENT SUMMARY

1. Rough-in procedures
   -plan, layout, cut holes
   -assemble and install drains
   -install water lines
   -rough in tub

2. Finishing procedures
   -set water closet
   -hang lavatory basin
   -connect water lines
   -finish and test

III. REFERENCES

Prime References -

1. *Plumbing Information Sheets*
2. *Steamfitting and Hot Water Heating Information Sheets*

The above are printed by the Canadian Plumbing and Heating Contractors, Ottawa, Ontario.

3. *Alberta Provincial Plumbing Code*
4. *C.S.A. Gas Code*
5. *Pipefitters Handbook by Frankland*
6. *Trane Company Publication in Two Volumes on Steam and Hot Water Heating*
7. *National Building Code of Canada - Plumbing section*

IV. CONTENT

Generalizations, concepts and behavioural objectives are outlined on the following pages. Teachers are expected to develop additional behavioural objectives and activities to develop additional behavioural objectives and activities to supplement the identified content and maintain relevancy.

Career Field: Construction and Fabrication

Topic I: ROUGHING-IN PROCEDURES

Major: Piping

Generalization A: A knowledge of the planning, assembling, and installing techniques for piping a house during construction is essential to domestic plumbing.

Course: Piping 22A
(Domestic Plumbing)

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Plan, lay out, cut holes, assemble and install drains, vents, and traps		a. given a blueprint or shop sketch of a house, lay out, cut necessary holes, assemble, install, grade, support, and test the pipes and fittings necessary for a domestic plumbing job according to Department of Health code requirements.	A framed mock-up of a house should be available so that students can do the piping required in as close to on-the-job conditions as is possible. Note: If space is adequate, build 5 framed areas 5' x 10' for this purpose.	
2. Plan, lay out, cut holes, assemble, prefabricate, and install rough water lines for a house		a. with the aid of a plan, install the water lines necessary in roughing in a house. Copper and plastic water piping can be used here.	The mock-up above is used for this purpose.	
3. Rough in the bathtub		a. move, uncrate and install a bathtub following trade procedures. He will also be able to attach the waste and overflow, etc.	Students can install a tub in the mock-up already mentioned.	
	75-85 hrs.			

Notes: Module #1 is a prerequisite.

Topic II: FINISHING PROCEDURES

Generalization B: A knowledge of the procedures required to hang, set, install, and connect roughed in plumbing to finished fixtures is essential in plumbing a house.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Setting a water closet		a. after proper demonstration and practice, install a water closet in a house.	Have students set a water closet in the mock-up of a house in which the roughing in has already been done.	
2. Connecting, hanging, or setting a lavatory basin		a. connect up a lavatory basin to roughed in piping.	The mock-up is used again here.	
3. Finishing a bath tub		a. install the trim for the tub.	Use the roughed in mock-up again.	
4. Connecting a kitchen sink		a. connect a kitchen sink to the roughed in water and waste pipes.	Use the mock-up again.	
5. Connecting water lines to the gas water heater and water meter		a. connect the hot and cold pipes required on a water heater as well as properly locate the safety valve.	Connect this up in the mock-up already mentioned.	
6. Connecting water lines to a water softener	40-50 hrs.	a. install the water lines to a water conditioner and know how to backwash same.	Use the mock-up mentioned throughout this module.	

Notes: This topic should follow Topic #1 of this module.
This finishes Module #2, at which time the students will have learned the skills necessary to do the plumbing in a typical house. Code use is necessary throughout.

VI. PIPING

3. Piping 22B

Domestic Heating

INTRODUCTION

Students may advance to Piping 22B from any one of the following introductory courses: Materials 10, General Technology 10 or Piping 12.

I. OBJECTIVES

The objectives of Piping 22B are to:

1. provide students with learning experiences in the correct installation of hot water heating equipment for a house (home).

2. provide students with learning experiences in the correct and safe installation of gas burning appliances.

II. CONTENT SUMMARY

1. Hot water heating
   -sizing and erecting boiler
   -selecting and installing radiation and convection systems
   -insulating and preparation for operation
   -adjusting and setting controls.

2. Gasfitting
   -domestic
   -planning, sizing, laying out, installing and testing gas piping in a house
   -sizing and erecting gas appliances
   -activating, adjusting, setting and servicing gas appliances
   -venting gas appliances for domestic use
   -converting gas appliances for domestic use.

III. REFERENCES

Prime References -

1. *Plumbing Information Sheets*
2. *Steamfitting and Hot Water Heating Information Sheets*

The above are printed by the Canadian Plumbing and Heating Contractors, Ottawa, Ontario.

3. *Alberta Pronvincial Plumbing Code*
4. *C.S.A. Gas Code*
5. *Pipefitters Handbook by Frankland*
6. *Trane Company Publication in Two Volumes on Steam and Hot Water Heating*
7. *National Building Code of Canada - Plumbing section.*

IV. CONTENT

Generalizations, concepts and behavioural objectives are outlined on the following pages. Teachers are expected to develop additional behavioural objectives and activities to supplement the identified content and maintain relevancy.

Topic I: HOT WATER HEATING

Major: Piping

Generalization A: A knowledge of the theory and installation skills necessary in heating a house with hot water is an essential part of piping.

Course: Piping 22B (Domestic Heating)

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Sizing, erecting and installing a domestic hot water boiler		a. given the manufacturers instructions, the proper tools, and materials, erect a domestic hot water boiler.	Install the heating system in a mock-up framed for this purpose, or use the same mock-up mentioned in Module #2 - Domestic Plumbing.	
2. Attaching boiler trim		a. given the correct equipment and tools, install or attach the trim required on a hot water boiler.		
3. Selecting and installing types of radiation and convection systems		a. after proper guidance, select and install the proper radiation or convection system for a home.		
4. Insulating and preparing the finished hot water heating system for operation				
5. Adjusting and setting the controls on a finished hot water heating system	50-60 hrs.	a. adjust and set the various controls on a hot water heating system for correct operation.		

Notes: May be taught as a separate module from all others except #1.
Consult the Boiler & Press. Vessel Act here for authority.

Topic II: GASFITTING - DOMESTIC

Generalization B: A knowledge of the components, characteristics, dangers, application of gas as a fuel for heating homes is essential to the piping industry.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Planning, sizing, laying out, installing, testing of the gas piping in a home		a. given specific information on procedure, plan, size, lay out, install and test the gas piping for a typical home.	Hook up the gas piping, meter and appliances in a typical on-the-job, three appliance installation.	
2. Sizing, locating, erecting and installing gas appliances		a. size, locate, erect and install gas appliances such as a furnace, water heater, stove, etc.		
3. Activating and adjusting finished gas appliances		a. activate, adjust and connect various gas appliances according to gas code requirements.		
4. Locating, setting, adjusting and servicing gas controls in a home		a. given appropriate information, locate, set, adjust, and service typical gas and electrical controls used with gas appliances.	All gas appliances installed can be used for these objectives.	
5. Venting gas appliances for domestic use		a. vent appliances according to gas code requirements. Students will check draft and be aware of positive, negative, and neutral draft in venting.	Place the vents on appliances to the outside air if possible for proper on-the-job functioning.	

Notes: The C.S.A. Standard Gas Codes for propane and natural gas form the basic authority in this topic.

Topic II: GASFITTING - DOMESTIC (Continued)

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
6. Converting gas appliances for domestic use		a. given the correct procedures, convert gas appliances from one gas to another. The use of orifices and their sizing is knowledge a student must possess for this objective.	Convert a natural gas appliance to propane, or vice-versa, by changing orifices, etc.	
	70-80 hrs.			

Notes:

VI. PIPING

4. Piping 220

Commercial and Industrial Heating

INTRODUCTION

Students may advance to Piping 22C after having completed any one of the following introductory courses: Materials 10, General Technology 10 or Piping 12.

I. OBJECTIVES

The course will provide students with experiences in the installation of low pressure (under 15 P.S.I.) steam heating equipment.

II. CONTENT SUMMARY

1. Low pressure steam heating
   -sizing, erecting and installing a low pressure steam boiler
   -selecting and installing radiators, convectors and unit heaters
   -adjust and set controls

2. Applications of steam other than heating
   -commercial uses of steam other than for heating
   -hanging and supporting pipe
   -expansion and contraction allowances

III. REFERENCES

Prime References -

1. *Plumbing Information Sheets*
2. *Steamfitting and Hot Water Heating Information Sheets*

The above are printed by the Canadian Plumbing and Heating Contractors, Ottawa, Ontario

3. *Alberta Provincial Plumbing Code*
4. *C.S.A. Gas Code*
5. *Pipefitters Handbook by Frankland*
6. *Trane Company Publication in Two Volumes on Steam and Hot Water Heating*
7. *National Building Code of Canada - Plumbing section.*

IV. CONTENT

Generalizations, concepts and behavioural objectives are outlined on the following pages. Teachers are expected to develop additional behavioural objectives and activities to supplement the identified content and maintain relevancy.

Career Field: Construction and Fabrication

Topic I: LOW PRESSURE STEAM HEATING

Major: Piping

Generalization A: A knowledge of the theory and installation of the skills required to use steam for heating purposes is essential to the industrial and commercial pipefitter.

Course: Piping 22C (Commercial and Industrial Heating)

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Sizing, erecting and installing a low pressure steam boiler		a. size, erect and install a steam boiler according to the requirements of the Boiler and Pressure Vessel Act and trade practices.	Install the boiler and necessary trim, piping and heating units in a framed mock up.	
2. Attaching boiler trim		a. given the correct information on procedures, attach boiler trim.		
3. Selecting and installing types of radiators, convectors and unit heaters with their various piping systems		a. given the information required, select and install various types of heating systems using steam as a heating medium.		
4. Insulating and preparing the finished steam boiler for operation		a. insulate and prepare a finished steam boiler for operation, (but observing the above may suffice).	Field trip to the school boiler room or other suitable site.	

Notes:

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
5. Adjusting and setting controls, condensate pumps, etc. on the finished steam boiler		a. adjust and set controls and pumps on a finished steam boiler and piping system.		
6. Indirect heating with steam, such as heating coils for hot water, etc.		a. given the proper information, install indirect heating steam coils in equipment.	Hook up the steam and condensate lines necessary for a steam coil in a hot water storage tank.	
	100-120 hrs.			

Notes: A minor module in framing and concrete forming plus welding and air conditioning will help students here.

Topic II: APPLICATIONS OF STEAM OTHER THAN HEATING

Generalization B: A knowledge of the many applications of steam for purposes other than heating gives flexibility and scope to the pipe tradesman's skills.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Discussing, observing and visiting industrial or commercial plants using steam in various ways other than heating		a. gain an appreciation of the complexity of heating applications in industry from visiting systems in use around the area.	Field trips to a commercial laundry, a refinery, the school boiler room, etc. will illustrate this sub-concept.	
2. Hanging and supporting pipe		a. hang and support pipe using varied types of hanger and supports, such as a) solid ring b) hanging strap c) hanging rod d) "C" clamps e) etc.	Hanging and supporting pipe would be done in all Modules except numbers 6 and 7, but specific time could be spent on the varied types at this point.	
3. Allowing for expansion and contraction		a. allow for expansion or contraction in steel, copper, or plastic piping in particular.	Use expansion joints, swing joins and other fittings which allow for pipe movement on shop projects, or see them on field trips.	
	25-30 hrs.			

Notes: It is assumed that the instructor will give the related science as part of his theory classes covering steam tables, latent, sensible and total heat, the B.T.U., etc.

VI. PIPING

6. Piping 32A

Shop Drawing, Sketching,
Estimating and Reading Blueprints

INTRODUCTION

Students may advance to Piping 32A upon completion of one of the introductory courses namely: Materials 10, General Technology 10 or Piping 12. Students should also have at least one "22" module in piping before advancing to this course.

I. OVJECTIVES

The objectives of Piping 32A are to:

1. provide students with opportunities to design and draw-up two and three dimensional drawings for a domestic installation.

2. provide students with opportunities to interpret drawings and make cost estimates of materials and labor.

II. CONTENT SUMMARY

1. Symbols and lines
2. Using the drawing instruments
3. Reading drawings
4. Draw simple plan and elevation sketch
5. Make an isometric drawing.

III. REFERENCES

Prime References -

1. *Plumbing Information Sheets*
2. *Steamfitting and Hot Water Heating Information Sheets*

The above are printed by the Canadian Plumbing and Heating Contractors, Ottawa, Ontario.

3. *Alberta Provincial Plumbing Code*
4. *C.S.A. Gas Code*
5. *Pipefitters Handbook by Frankland*
6. *Trane Company Publication in Two Volumes on Steam and Hot Water Heating*
7. *National Building Code of Canada - Plumbing section.*

IV. CONTENT

Generalizations, concepts and behavioural objectives are outlined on the following pages. Teachers are expected to develop additional behavioural objectives and activities to supplement the identified content and maintain relevancy.

Career Field: Construction and Fabrication

Topic I: SYMBOLS, SCALES, SPECIFICATIONS, ROUGH-IN BOOKS, DRAWING INSTRUMENTS, TYPES OF LINES AND DRAWINGS

Major: Piping

Generalization A: A knowledge of the tools, techniques, and language of blueprints is essential to planning piping in a building.

Course: Piping 32A
(Shop Drawing, Sketching
Estimating and Reading
Blueprints)

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Using the drafting instruments		a. given the information, use the drafting instruments such as the Board, "T" square, 60° - 30° set square, pencils, etc.	Practice using these tools of the craftsman.	
2. Using symbols, scales, lines and rough-in books		a. given the information, use symbols, scales, lines, and rough in books in doing shop drawings and reading blueprints.	Draw simple objects and read blueprints from jobs familiar to them such as the school blueprint, if available.	
3. Blueprint language		a. given the terms and their explanation, understand the language used in blueprinting and the importance of the accompanying specifications.	Use a set of blueprints and specifications in a shop assignment.	
	25-30 hrs.			

Notes: A minor in basic drafting and blueprint reading could be a co-requisite with this course.

Topic II: DRAWING PLANS AND ISOMETRIC VIEWS OF PIPING

Generalization B: The ability to interpret blueprints from the two dimensional to three dimensional (isometric) helps a pipe tradesman in laying out work.

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Draw a simple plan and elevation sketch		a. given the proper information in Topic #1, and the principles of orthographic projection, draw two dimensional views of a simple object.	Draw simple objects, such as a block of wood.	
2. Combining views in an isometric drawing		a. with the proper instruments and information, draw a simple object in isometric, then a simple one line isometric of a piping lay out.	Draw isometrics freehand in order to take the two dimensional plan view and give it perspective.	
3. Applying isometric drawing		a. with the proper instruments and information, draw a simple object in isometric, then a simple one line isometric of a piping lay out.		
		b. Use an isometric drawing made in (a) above. Make a material list and estimate material and labor costs.		
	100-110 hrs.			

Notes: This is an applied and practical drafting module, with the emphasis on: Plan to Isometric (perspective) to Actual Job Use - therefore, lettering etc. is of little importance!

VI. PIPING

5. Piping 32B

Commercial and Industrial Plumbing

INTRODUCTION

Students may advance to Piping 32B from one of the introductory courses namely: Materials 10, General Technology 10 or Piping 12. This course is best taken in combination with any of the other "22" or "32" level courses.

I. OBJECTIVES

The course will provide students with the opportunity to design and practice installation techniques for commercial buildings.

II. CONTENT SUMMARY

1. Plumbing procedures used in multiple storied buildings or industrial plants
    - -sizing vents and drains
    - -installing sleeves and inserts for running pipes through concrete
    - -prefabrication techniques
    - -setting fixtures
    - -sizing rainwater leaders
    - -soventing techniques.

III. REFERENCES

Prime References=-

1. *Blue Print Reading for the Pipe Trades - Frankland*
2. *Plumbing Information Sheets*
3. *Steamfitting and Hot Water Heating Information Sheets*

The above are printed by the Canadian Heating and Plumbing Contractors, Ottawa, Ontario.

4. *Alberta Provincial Plumbing Code*
5. *C.S.A. Gas Code*
6. *Pipefitters Handbook by Frankland*
7. *Trane Company Publication in Two Volumes on Steam and Hot Water Heating*
8. *National Building Code of Canada - Plumbing section*

IV. CONTENT

Generalizations, concepts and behavioural objectives are outlined on the following pages. Teachers are expected to develop additional behavioural objectives and activities to supplement the identified content and maintain relevancy.

Career Field: Construction and Fabrication

Topic I: ROUGHING IN AND FINISHING PROCEDURES IN MULTIPLE STORIED BUILDINGS OR INDUSTRIAL PLANTS

Major: Piping

Generalization A: A knowledge of the techniques required to size and install the venting and drainage in large buildings is essential to the pipe tradesman.

Course: Piping 32B (Commercial and Industrial Plumbing)

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
		The student will:		
1. Sizing vents and drains in large buildings using the "fixture unit" principle and tables in the plumbing code		a. given the plumbing code and the fixture unit principle, size vents and drains in a large building.	Use shop drawings, blueprints, or schematics for illustrating these ideas and procedures.	
2. Installing sleeves and inserts for running and hanging pipes in large buildings before cement is poured onto forms		a. given information on blueprint reading and industrial construction techniques, install sleeves and inserts for running risers, stacks, and hangers in construction other than wood.	Visit jobs under construction to observe these procedures and, if possible, have sleeves, inserts, etc. on hand for illustration of points covered by the objectives.	
3. Prefabrication Techniques		a. given shop drawings, make up sections of the plumbing prior to installation on the job. This can be done in copper, M.J. or plastic piping.	Do a shop project involving multiple water closets or lavatory basins, vented and drained in accordance with code and trade practice.	

Notes:

Topic I: ROUGHING IN AND FINISHING PROCEDURES IN MULTIPLE STORIED BUILDINGS OR INDUSTRIAL PLANTS (Continued)

Generalization

Concept and Sub-Concepts	Approx. Time	Behavioural Objectives	Activities or Jobs	Resources
4. Setting fixtures not done in Module #2, such as wall hung fixtures, etc.		a. given the correct information procedures, install fixtures associated with larger buildings.	Install at least one wall hung fixture as a shop project.	
5. Sizing rain water leaders		a. given the plumbing code and the correct procedures, correctly size rain water leaders and storm drains.	Use shop drawings and problems here.	
6. "Soventing" Techniques		a. with the knowledge available on this new development in plumbing, gain an appreciation of its future implications.	Compare the traditional system of plumbing tall buildings with the new sovent system by comparing isometrics of both. See note below.	
	120-130 hrs.			

Notes: Sub-Concept #6 is illustrated in the Copper Development Association Magazine, Edition #47, Winter 1971.
The Alberta Provincial Plumbing Code is the Authority here. City code can be used as comparison if such applies.

VI. PIPING

7. Piping 32C

PIPING 32C

The last module in the Piping sequence is open to students who have completed 30 weeks or six modules in the major.

The 125 hours of instruction time available in this module may be used to:

a. provide greater depth to a module taken previously. Individual students, groups of students, or the whole class may elect to study an area in more detail. This could be in domestic plumbing, commercial plumbing, heating, air conditioning, or any of the modules named in the Piping sequence, or

b. engage in actual pipe fitting or plumbing work supervised by the Piping teacher as a coordinator and a journeyman on the job.

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